

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In Re the Application of

Hans van der Laan, *et al.*

Group Art Unit: 2877

Application No.: 10/590,352

Examiner: Tri T. Ton

Filed: May 21, 2007

Confirmation No.: 8164

For: METHOD TO DETERMINE THE VALUE OF PROCESS PARAMETERS BASED
ON SCATTEROMETRY DATA

REPLY BRIEF UNDER 37 C.F.R. § 41.41

Mail Stop Appeal Brief - Patents

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This Appeal is from the Final Office Action mailed February 19, 2010 (hereafter "Office Action"), rejecting claims 1-12, 16, 18-20, 22-33, 37, and 39-41 of the above-identified patent application. This brief is in response to the Examiner's Answer dated November 17, 2010.

No fee is believed to be due, however in the event the Office determines that any fee is due, the Director is authorized to charge any additional fees that may be due, or credit any overpayment of same to Deposit Account No. 033975 (**Ref. No. 081468-0356680**).

REQUIREMENTS OF 37 C.F.R. § 41.41 AND MPEP 1208

I. STATUS OF CLAIMS (MPEP 1208(I)(B))

The Examiner's Answer did not alter the status of any pending rejection, therefore:

Pending: Claims 1-16, 18-20, 22-37 and 39-41 are pending.

Withdrawn: No claims have been withdrawn.

Canceled: Claims 17, 21, 38 and 42 are canceled.

Rejected: Claims 1-12, 16, 18-20, 22-33, 37 and 39-41 stand rejected.

Objected: Claims 13-15, and 34-36 were objected to.

Allowed: No claims have been allowed.

On Appeal: Claims 1-12, 16, 18-20, 22-33, 37 and 39-41 are on appeal.

II. GROUND OF REJECTION TO BE REVIEWED ON APPEAL (MPEP 1208(I)(C))

Appellant maintains the appeal of:

1) The rejection of claims 1-12, 16, 18, 19, 22-33 and 37-40 under 35 U.S.C. §102(e) as allegedly being taught by U.S. Patent Application Publication No. 2003/0048458 to Mieher, *et al.* (hereinafter "Mieher"); and

2) The rejection of claims 20 and 41 under 35 U.S.C. §103(a) as allegedly being unpatentable over Mieher in view of U.S. Patent No. 6,917,901 to Bowley, Jr., *et al.* (hereinafter "Bowley").

VII. ARGUMENT (MPEP 1208(I)(D))

1. The rejection of claims 1-12, 16-19, 22-33 and 37-40 under 35 U.S.C. §102(e) over Mieher.

Under 35 U.S.C. § 102, "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Independent Claims

A. Claim 1

The rejection of claim 1 is improper for at least the reason that Mieher does not teach all of the features of the claimed invention.

In particular, Appellant submits that the cited portions of Mieher do not teach or suggest a method for determining at least one process parameter in a device manufacturing process that includes determining a mathematical model by using known values of at least one process parameter and by employing a multi-variant regression technique on the calibration spectral measurement data, the mathematical model comprising a number of regression coefficients; and comparing the obtained spectral measurement data with the calibration spectral measurement data to determine the unknown value of said at least one process parameter for said object from said obtained spectral measurement data by employing said regression coefficients of said mathematical model, as recited in claim 1.

- i. Shape Parameter Information is not Spectral Measurement Data

Claim 1 recites determining a mathematical model by using known values of at least one process parameter and by employing a multi-variant regression technique on calibration spectral measurement data.

The Examiner's Answer takes the position that shape parameter information is a type of spectral measurement data and that therefore Meier's operation on shape parameter information anticipates Appellant's recited spectral measurement data. See Examiner's Answer, p. 9. In making this argument, the Examiner relies on a definition that does not appear to be relevant to the position taken. Specifically, the cited text says, "the scatterometry data *is interpreted into* shape parameter information." See, Examiner's Answer, p. 9. In this context, the clear meaning of "interpreted" is "transformed," not "ascribed the meaning of," which would make no sense in view of the preposition "into" appearing after "interpreted." Thus, the offered definition can be seen to lack any relevance to the interpretation of Meier. To the contrary, Meier is describing a transformation of the data from one type to another, different type from the type recited in claim 1.

The fact that Meier distinguishes the two types of data in paragraph [0047] does not mean that the two are "not different" as asserted in the Examiner's Answer. See, Examiner's Answer, p. 10. Instead, the only logical conclusion is that Meier understands these to be two different things. It is notable that no embodiment of Meier teaches the use of spectra, but rather each specifically addresses shape parameters. That is, there is no showing of the identical invention is as complete detail as in the claim as required under §102(a).

ii. Mieher's Regression Analysis is not the Recited Regression Analysis

Claim 1 recites determining a mathematical model (i) by using known values of at least one process parameter and (ii) by employing a multi-variant regression technique on the calibration spectral measurement data. Both steps (i) and (ii) are therefore, needed for "determining a mathematical model" in claim 1.

The Examiner's Answer alleges that Meiher's use of a regression analysis on the spectra to determine the shape parameters meets this recitation. See, Examiner's Answer, p. 10. However, the Examiner's Answer still fails to show that Meiher teaches determining a mathematical model comprising a number of regression coefficients by using values of a process parameter and by employing a multi-variant regression technique on the calibration spectral measurement data as recited in claim 1.

As previously stated, the cited portion of Mieher describing regression techniques does not relate to determining a mathematical model comprising a number of regression coefficients. To the contrary, the cited portions of Mieher disclose that *"the scatterometry data (e.g., measured spectra) is interpreted into shape parameter information. This may be accomplished using iterative regression techniques and/or by library matching techniques such as those previously described, i.e., match the measured spectra with libraries that link profiles with spectra."* [Mieher, ¶ 80, emphasis added]. That is, Mieher's regression techniques are used solely for converting scatterometry data into shape parameter information, not for determining a mathematical model comprising a number of regression coefficients. As discussed above, shape parameter information is not the same as spectral measurement data,

and no evidence has been presented that Mieher teaches a mathematical model comprising a number of regression coefficients.

Mieher also describes solving equations/solutions (which the Office Action asserts is a mathematical model¹) to determine the focus-exposure dependencies of multiple shape parameters. [See Mieher, ¶¶ 56 and 60]. Again, the alleged mathematical model in Mieher is determined using shape parameter information – not using calibration spectral measurement data. While the Office states that paragraphs [0061] – [0065] and [0066], lines 1-3, of Mieher allegedly teach a mathematical model comprising a number of regression coefficients,² Appellant submits that this portion of Mieher does not appear to be linked in any way to the regression analysis of ¶80 (which was the process by which scatterometry data was converted into shape parameters). Appellant notes that this contention does not appear to be specifically rebutted in the Examiner's Answer.

ii. Mieher's Comparing is not the Recited Comparing

As already noted, even Mieher distinguishes spectral measurement data from shape parameter data. Furthermore, Mieher does not teach performing a comparison using regression coefficients of a mathematical model as recited.

Further, as already discussed, to the extent that the cited portions of Mieher teach using regression, they are used for a different purpose (i.e., to convert spectral data to shape parameter information). [See, e.g., Mieher, ¶ 80, lines 1-3]

¹ See Examiner's Answer, page 11 ("Sum Square Error is not different from mathematical model")
² See Office Action, page 3.

For at least these reasons, the rejection of claim 1 is improper and must be withdrawn.

B. Claim 22

The rejection of independent claim 22 is improper for at least the reason that Mieher does not teach or disclose all the features of the claimed invention.

Appellant submits that the above discussion of claim 1 is applicable to claim 22 as well.

* * *

Accordingly, for each of the foregoing reasons, Appellant respectfully submits that a case of anticipation has not been established and that the cited portions of Mieher fail to disclose or teach each and every feature recited in independent claims 1 and 22. Claims 2-12, 16, 18, 19, 23-33, 37, 39 and 40 ultimately depend from one of independent claims 1 and 22, and are therefore, patentable for at least the same reasons provided above related to claims 1 and 22, and for the additional features recited therein. Thus, Appellant respectfully requests that the rejection of claims 1-12, 16, 18, 19, 22-33, 37, 39 and 40 under 35 U.S.C. § 102(e) over Mieher should be withdrawn and the claims be allowed.

Dependent Claims

A. Claims 4 and 25

The Examiner's Answer contends that non-linear regression as allegedly taught in paragraph [0080] "is not different from non-linear principal component regression,"

without providing any evidence that this is true. As set forth in Appellant's Appeal Brief, non-linear regression is a genus while non-linear principle component regression as claimed may be a particular species of non-linear regression (though Appellant does not concede this and the Office has provided no evidence or reasoning as to why this might be true). Even if true, a genus does not anticipate a claimed species and the Examiner's Answer has failed to rebut Appellant's argument in this regard.

For at least the foregoing reasons, the rejection of claims 4 and 25 is improper and must be withdrawn.

B. Claims 10 and 31

Claims 10 and 31 further recite "preprocessing [preprocess] the obtained calibration spectral measurement data and the obtained spectral measurement data before said employing said regression coefficients." Appellant notes that the portion of the Examiner's Answer discussing this recitation (p. 13, ¶[c]) does not make any reasoned rebuttal of Appellant's contention that Meiher fails to teach preprocessing as recited.

For at least the foregoing reasons, the rejection of claims 10 and 31 is improper and must be withdrawn.

C. Claims 11 and 32

Appellants note that the recited "angle" is an optical parameter (it is of a kind with wavelength and polarization state in the claim language) and the asserted "sidewall angle" is a physical property of a structure on a processed substrate. Moreover, nothing

cited in paragraphs [0060-68] appears to relate to *preprocessing* of calibration spectra and obtained spectral measurement data as recited. To the contrary, these paragraphs relate solely to the processing of shape parameters to solve for focus and exposure.

For at least the foregoing reasons, the rejection of claims 11 and 32 is improper and must be withdrawn.

* * *

For at least the foregoing reasons, the rejection of claims 1-12, 16, 18, 19, 22-33, 37, 39 and 40 under 35 U.S.C. §102(e) over Mieher is improper and must be withdrawn.

2. The rejection of claims 20 and 41 under 35 U.S.C. §103(a) in view of Mieher and Bowley.

A. Dependent claims 20 and 41

Even assuming *arguendo* that the cited portions of Mieher and Bowley are properly combinable (which Appellant does not concede), Appellant submits that the cited portions of Bowley do not overcome the deficiencies of Mieher.

For instance, the Office merely relies upon Bowley to allegedly show a support structure configured to support a patterning structure and a substrate table configured to hold the substrate.

Therefore, Appellant respectfully submits that a *prima facie* case of obviousness has not been established, and that the cited portions of Mieher, Bowley, or a proper combination thereof, fail to disclose or otherwise render obvious each and every feature recited in independent claims 1 and 22.

Claims 20 and 41 depend from claims 1 and 22, respectively, and are therefore, patentable for at least the same reasons provided above related to claims 1 and 22 and for the additional features recited therein. Thus, Appellant respectfully requests that the rejection of claims 20 and 41 under 35 U.S.C. § 103(a) over Miehner in view of Bowley should be withdrawn and the claims be allowed.

CONCLUSION

For at least the foregoing reasons, Appellant respectfully requests that the rejections each of pending claims 1-12, 16, 18-20, 22-33, 37 and 39-41 be reversed.

Respectfully submitted,

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